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Agricultural Research Administration

BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY'S

S O U T H E R N R E G I O N

LIST OF PUBLICATIONS AND PATENTS

January-June 1953

Single copies of available reprints may be obtained upon request. Copies of patents may be purchased from the U. S. Patent Office, Washington, D. C.

Southern Regional Research Laboratory, New Orleans, La.

Sugarcane Products Laboratory, Houma, La.

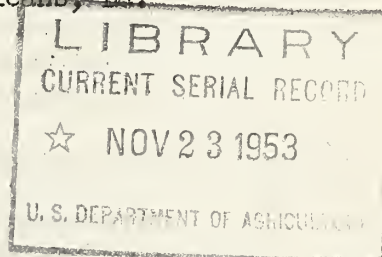
Tung Oil Laboratory, Bogalusa, La.

Naval Stores Station, Olustee, Fla.

Citrus Products Laboratory, Winter Haven, Fla.

Food Fermentation Laboratory, Raleigh, N. C.

Fruit and Vegetable Products Laboratory, Weslaco, Texas



Southern Regional Research Laboratory
2100 Robert E. Lee Boulevard
New Orleans 19, Louisiana

C O N T E N T S

	Page
Cotton	
Fiber and fundamental investigations.	1
Mechanical processing.	3
Chemical processing	3
Oilseeds and other oil-bearing materials	
Properties and composition	4
Processing and storage	6
Glyceride oils and fatty acids.	9
Meals and proteins.	11
General	12
Sugarcane and derived products	
Properties and composition	13
Processing	13
Confectionery.	14
Fruits and vegetables	
Citrus fruits	15
Vegetables	16
Pine gum and derived products	17
Miscellaneous	17
Research achievement sheets.	19
U.S.D.A. news releases	19
Republications	19

BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY'S

SOUTHERN REGION

The Southern Regional Research Laboratory was authorized by Congress in 1938 as one of four regional laboratories whose purpose is to develop new and extended outlets for farm crops. It is a unit of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

The U-shaped brick building, completed in 1941, is located on a 40-acre tract of land donated by the City of New Orleans, and contains nearly 4 acres of floor space.

Crops studied are cotton lint, sweetpotatoes, sugarcane, cottonseed, rice, peanuts, and other Southern oilseeds. The Laboratory is headquarters for six field stations investigating citrus and other fruits, cucumbers and other vegetables, tung fruit, sugarcane, and pine gum. States served are Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Puerto Rico is part of the Southern Region.

Many of the developments of the Southern Laboratory have been put to work for the farmer and industry. These include a new machine for opening and fluffing bales of cotton before cleaning for spinning; a loom attachment for weaving naturally waterproof cotton fabrics; acetylated cotton, highly resistant to mildew, rot, and heat; a "disappearing" cotton yarn, strong enough to weave but soluble in water; information demonstrating that dyed and printed fertilizer bags have re-use value in making wearing apparel; an improved elastic bandage; a machine to cut short-staple cotton and cotton waste into a linter-like product; improved methods for extracting Southern oilseeds; information to aid peanut butter manufacturers; processing data on fibers and glues from cottonseed and peanut protein; oil from rice bran; starch from sweetpotatoes -- plus many advances in the knowledge of chemistry, physics, and engineering.

Research at field stations has contributed to commercialization of frozen citrus concentrates and fresh-pack cucumber pickles; and to improvements in pine gum processing that have modernized the naval stores industry.

No.

COTTON

Fiber and Fundamental Investigations

- 1 CONRAD, C. M., and RUSCA, R. A.
VISCOMETRIC STUDIES OF CELLULOSE IN COTTON IN RELATION TO MECHANICAL
PROCESSING. Textile Res. Jour. 23(3): 168-174. 1953.

To determine whether or not the mechanical processing of cotton fibers into yarn causes any chemical degradation to the cellulose, 4 sets of samples were studied. One set had been powdered in a Wiley mill; another, processed several times through the SRRL cotton opener; a third, mechanically processed conventionally in the Southern Laboratory's textile mill; the fourth consisted of portions of samples used by investigators outside the Laboratory, Kriebel and Whitwell (see Textile Res. Jour. 19, p. 556, 1949), supplied by them for these experiments. Viscosity measurements determined by the SRRL simplified techniques failed to show any chemical damage to the cellulose which could be associated with ordinary textile processing.

- 2 LOEB, L., and WELO, L. A.
MAGNETIC ANISOTROPY OF CELLULOSIC MATERIALS. Textile Res. Jour. 23(4):
251-257. 1953.

Results of a survey of the magnetic anisotropy of cellulosic materials measured according to the Krishnan "oscillation" method are presented, and a technique is described for applying this method to fibrous materials based on a pretreatment with cold dilute acid. Data showing the effect on the observed anisotropy of variations in this pretreatment are given. The possible usefulness of the measurements in characterizing molecular orientation is discussed. For a given crystalline modification (cellulose I or II), the anisotropy is primarily a function of molecular orientation, but varies with orientation in a different manner for the two modifications. The influence of variations in the amount of crystalline material on values is discussed.

- 3 MOORE, A. T.
STAINS FOR THE PRIMARY WALL OF THE COTTON FIBER. Stain Technol. 28(3):
149-154. 1953.

Several methods are described for distinguishing between the primary wall of the cotton fiber, the lumen, and the secondary wall. The primary wall, a membrane less than 0.5μ thick covering the entire fiber, was stained while attached to the fiber and after it had been mechanically stripped from the fiber. Stains include aqueous or alcoholic solutions of ruthenium red, methylene blue chloride, Nile blue sulfate, oil red, Sudan black B, iodine, and Simons' stain. Various concentrations of sodium hydroxide, cupri-ethylenediamine hydroxide, or sulfuric acid

No.

were used to enhance color changes and to swell the cellulose. Fibers stained with Simons' stain and then swelled with dilute cupri-ethylenediamine hydroxide showed the greatest color differences between the primary wall and the lumen.

- 4 NELSON, M. L., and TRIPP, V. W.

DETERMINATION OF THE LEVELING-OFF DEGREE OF POLYMERIZATION OF COTTON AND RAYON. Jour. Polymer Sci. 10(6): 577-586. 1953.

Effects of varying hydrolytic conditions on change in estimated degree of polymerization of cotton linters and viscose rayon have been explored by varying the acid concentration downward over the range of 2.5 N to 0.01 N and by carrying out the hydrolysis at 100° and at 80°. The temperature and acid concentration did not affect appreciably the leveling-off DP, but affected the rate of hydrolysis. An alternative way of determining the leveling-off DP is presented in which the leveling-off DP is considered that value on the curve of DP versus residue percentage, under conditions of continuous hydrolysis, at which the slope of the tangent to the curve first attains a minimum absolute value. Moisture regain data on the hydrocelluloses indicate that either in the aqueous hydrolytic medium or during drying cotton linters may recrystallize slightly, while rayon does so in a significantly greater amount.

- 5 NEWMAN, S., LOEB, L., and CONRAD, C. M.

VISCOSITY, SEDIMENTATION, DIFFUSION, AND OSMOTIC BEHAVIOR OF LONG-CHAIN NITROCELLULOSE MOLECULES. Jour. Polymer Sci. 10(5): 463-487. 1953.

The intrinsic viscosity, sedimentation, diffusion, and osmotic properties of 4 long-chain unfractionated nitrocellulose polymers have been compared, to investigate the relation between molecular weight as determined by absolute methods and intrinsic viscosity, based on long-chain celluloses nitrated in a reproducible manner but differing widely in molecular weight; the effect of rate of shear on intrinsic viscosity of samples giving non-Newtonian solutions; how the data fit in with theory regarding the behavior of flexible linear macromolecules in dilute solution; the interrelation of some results of the concentration dependence measurements in terms of fundamental molecular parameters. Results affirmed the existence of a marked shear dependence of intrinsic viscosity, increasing with molecular weight, and validated viscosity techniques.

- 6 SEGAL, L., NELSON, M. L., and CONRAD, C. M.

FURTHER STUDIES ON COTTON CELLULOSE WITH REDUCED CRYSTALLINITY. Textile Res. Jour. 23(6): 428-435. 1953.

Variables in the application of anhydrous ethylamine to cotton cellulose to reduce crystallinity have been studied. Crystallinity was estimated by the acid-hydrolysis residue method; crystallite length was indicated by the "leveling-off" degree of polymerization.

No.

Crystallinity was reduced rapidly and independently of the degree of polymerization. The maximum reduction occurred in material free of tension. Crystallite orientation was essentially unaffected by the treatment. The cellulose II pattern was always found in the cellulose after contact with mercerizing caustic, regardless of the sequence of treatment. A crystallite length of 150 anhydroglucose units seems to be a more stable structure after the treatment than the 225 units usually found in native cotton.

Chemical Processing

- 7 REEVES, W. A., DRAKE, G. L., and HOFFPAUIR, C. L.
PROCESS FOR THE PRODUCTION OF ETHYLENIMINES. U. S. Patent No.
2,636,880; April 28, 1953.

The process produces paraffinic ethylenimines. A basic solution of 2-aminoalkyl hydrogen sulfate (2-aminoethyl hydrogen sulfate) and alkali metal hydroxide (sodium hydroxide) containing from 25% to 50% dissolved materials based on the combined weight of the sulfate and hydroxides, is prepared and almost instantaneously heated to a temperature between the boiling and decomposition temperatures of the formed paraffinic ethylenimine, as by flash distillation, the ethylenimine being volatilized and then readily isolated in pure form and high yield.

Mechanical Processing

- 8 RUSCA, R. A.
(1) RESEARCH TO INCREASE PROCESSING EFFICIENCY AND QUALITY OF COTTON PRODUCTS. (2) NEW DEVELOPMENTS IN THE INITIAL PROCESSING OF COTTON. (Two articles processed by National Cotton Council for inclusion in a pamphlet distributed at European Conferences.) June 1953.

(1) Increasing quantities of mechanically harvested and other cottons of high trash content have led to improvement of textile cleaning equipment. Conventional opening-picking organizations are compared with modern opening-picking organizations that provide more effective cleaning with less fiber damage. Several new machines for blending, opening, and cleaning are described, and results of mill applications of this new equipment to processing American upland cottons are presented.

(2) Recent research studies in the field of cotton textile processing include the development of new guides for the proportionment of draft for long-draft roving systems; the determination of the relation between single and ply yarn twists and ply yarn properties; effect of fiber strength on ply yarn properties; and effect of fiber fineness on single yarn strength. Examples are given of how yarn manufacturers can make practical use of this information.

No.

9 WALLACE, E. F.

HOW TO IMPROVE WINDING OF YARN-GRADING BOARDS. Textile
World 103(3): 111. 1953.

Modifications of the Suter Yarn Evenness Controller are described that enable the instrument to more accurately and uniformly wind yarn boards used for the evaluation of yarn grade according to ASTM yarn appearance standards.

OILSEEDS AND OTHER OIL-BEARING MATERIALS

Properties and Composition

10 CASTILLON, L. E., KARON, M. L., ALTSCHUL, A. M., and
MARTIN, F. N.

PREPARATION OF COMBINATION PRODUCTS OF GOSSYPOL WITH
GLYCINE AND DEXTROSE AND THEIR TOXICITY TOWARD MICE.
Arch. Biochem. and Biophys. 44(1): 181-188. 1953.

Combination products of gossypol with glycine and with dextrose have been prepared. Acute oral toxicity investigations indicate that the freshly prepared gossypol-dextrose combination product is more toxic than isolated gossypol and as toxic as isolated pigment glands. The gossypol-glycine combination product is nontoxic when administered in dosages as large as 12.0 g. kg. body weight of mice. Purified gossypol-glycine has been isolated and found to be a water-soluble, nitrogen-containing compound. It differs from gossypol in many of its properties.

11 DEMINT, R. J., CUCULLU, A. F., and HOFFPAUIR, C. L.

DETERMINATION OF MOISTURE, OIL, AND FREE FATTY ACIDS IN CASTOR
BEANS. Amer. Oil Chem. Soc. Jour. 30(6): 225-227. 1953.

Castor beans may be satisfactorily prepared for analysis by grinding in a food chopper equipped with a 12-tooth blade. To determine moisture and volatile matter, a 5-g. sample of ground beans or pomace or a 50-g. sample of whole beans should be dried for 2 and 4 hours, respectively, at 130° C. in a forced-draft oven. To determine oil, a 5-g. sample of ground beans should be extracted as directed by the A.O.C.S. Official Method, using carbon tetrachloride for 2 hours, reground with 0.5 g. of 60- to 80-mesh sand, and then extracted for 2 more hours. For castor pomace similar extraction for 4 hours without regrinding is satisfactory. The free fatty acid content can be determined by extracting the ground beans at room temperature with methyl alcohol and titrating the extracted oil as directed in A.O.C.S. Official Method after removal of solvent by heating under reduced pressure.

No.

- 12 HOLMES, R. L., and MCKINNEY, R. S.
TUNG HULLS AND PRESS CAKE. AIC-357. pp. 14, 1953.

Complete information is given on the chemical composition of commercial hulls (a mixture of outer hulls, inner hulls, and shell) and the press cake produced in each of the 14 tung mills operating in the United States, and on the amounts available from domestic production. Some hulls are used in mixed fertilizers; as a source of additional organic matter in the growing of tung trees; and as a mulching material for ornamental shrubs. All press cake is sold as fertilizer. Extended uses are needed in a rapidly growing Southern tung oil industry. About 72,000 tons of hulls and about 21,000 tons of press cake were available in 1952. At present, existing uses appear to be brightest.

- 13 KING, W. H., and THURBER, F. H.
AN IMPROVED PROCEDURE FOR THE PURIFICATION OF GOSSYPOL. Amer. Oil Chem. Soc. Jour. 30(2): 70-74. 1953.

Methods of dissociating the gossypol-acetic acid complex prepared from the butanone extract of defatted cottonseed flakes and methods of re-crystallizing gossypol were studied. The study led to the development of an improved rapid procedure for the purification of gossypol. The degree of purity of the gossypol prepared by the improved procedure was determined by a number of tests, which are described. Spectral and titration curves for pure gossypol are presented, and standards of purity are suggested. The molecular weight of gossypol and gossypol-acetic acid prepared by the procedures described is approximately 518 and 578, respectively.

- 14 LAMBOU, M. G.
2,3,5-TRIPHENYLTETRAZOLIUM CHLORIDE AS A RAPID INDICATOR OF VIABILITY IN COTTONSEED. Sci. 117(3051): 690-693. 1953.

A modification of Porter's method (Porter, R. H., Durrell, M., and Ramm, H. J. Plant Physiol. 22, 149, 1947) of applying the tetrazolium chloride test to longitudinal sections of the whole cottonseed was applied to untreated seed and to seed that had been heat-treated and exposed to high-energy cathode rays and stored in a sealed container for several weeks. Results were compared with those from the standard germination test on seed drawn from the same lots. Data indicated the possibility of using this stain by the modified procedure for rapidly detecting the germinating capacity of cottonseed. Modifications consisted of using a stronger solution of the stain than that used by Porter, and removing the lint and coat from the kernel since Porter had observed that these did not react with the dye. "Hard" seed (seed that did not imbibe water) were excluded because Porter found that they did not react.

No.

- 15 STANSBURY, M. F., PONS, W. A., Jr., and HOFFPAUIR, C. L.
 PHOSPHORUS COMPOUNDS IN COTTONSEED KERNELS. INFLUENCE OF VARIETY OF
 COTTONSEED AND ENVIRONMENT. Agr. and Food Chem. 1 (1): 75-78. 1953.

Information about the types and amounts of phosphorus compounds present in cottonseed is basic to any comprehensive consideration of the nutritive value of cottonseed products. Data are reported for seven types of phosphorus compounds in 58 samples of cottonseed kernels selected so that effects of varietal and environmental factors could be indicated. The influence of environment on the values for total, acid-soluble, phosphatide, inorganic, and phytin phosphorus, calculated to either a moisture-free or moisture-and oil-free basis, was highly significant statistically as compared to variety. A significant correlation coefficient (+0.989) was obtained for the relation between total phosphorus and phytin phosphorus contents of the moisture-free kernels. The regression equation for this relation should prove useful for prediction purposes.

Processing and Storage

- 16 COUSINS, E. R., FORE, S. P., JANSSEN, H. J., and FEUGE, R. O.
 RICE BRAN OIL. VIII. TANK SETTLINGS FROM CRUDE RICE BRAN OIL AS A
 SOURCE OF WAX. Amer. Oil Chem. Soc. Jour. 30(1): 9-14. 1953.

A typical sample of tank settlings from crude rice bran oil was processed to obtain a hard, nontacky wax fraction. Four procedures were investigated. One consisted of removal of the oil from the tank settlings by washing with acetone, destruction of the phosphatides through hydrolysis or saponification, and purification by fractionation from isopropanol solution. Another involved hydration of the tank settlings, followed by separation of the aqueous and oil phases, and fractionation of the oil phase from isopropanol solution. A third and fourth procedure used simple fractionation of the tank settlings with the aid of solvents. Yields of the hard wax fractions varied from 8.3 to 13.7%, based on weight of original settlings. Iodine values varied from 11.1 to 17.6, free fatty acid contents from 2.1 to 7.3%, phosphorus contents from 0.01 to 0.15%. Lowest melting point was 75.3°C. and highest 79.9. Hard wax in the liquid state was almost black and could not be bleached readily with activated clay or carbon but practically white waxes could be produced with 0.5 part of 29% hydrogen peroxide in combination with 1 part of chromium trioxide per 1 part of wax.

- 17 D'AQUIN, E. L., VIX, H.L.E., SPADARO, J. J., GRACI, A. V., Jr., EAVES, P. E., REUTHER, C. G., Jr., MOLAISSON, L. J., McCOURTNEY, E. J., CROVETTO, A. J., and GASTROCK, E. A.
 FILTRATION-EXTRACTION OF COTTONSEED. Indus. and Engin. Chem. 45(1): 247-254. 1953.

The pilot-plant development of filtration-extraction is described and data on pilot-plant runs are reported. This simplified solvent process overcomes most problems of direct solvent extraction and is applicable

under conditions in smaller as well as in larger mills. The principal unit of equipment is a continuous, horizontal vacuum filter. Oil extraction consists of a flake-miscella mixing-soaking operation followed by high-capacity vacuum filtration and countercurrent washing. Another departure of the process from conventionality is mild precooking of the flakes.

- 18 GASTROCK, E. A., and PERSELL, R. M.

DIVIDING OIL MILLS OPERATIONS TO BOOST PROFITS SAID HELPFUL. Cotton Trade Jour. 33(19): 8. 1953. Also in Oil Mill Gazetteer 57(12): 27. 1953. (Erroneously under the title of another article, Use of Preparation Techniques to Overcome Cottonseed Variables).

The process engineer seeking to increase oil mill profits will find it convenient to divide the operations of such a mill into purchasing the seed, processing the seed into oil, meal, hulls, and linters of a marketable quality, and selling these products at a profit. Factors which determine profits are the relation between seed costs and product prices, volume of the seed processed, and performance of the mill. (An analysis of these factors has been found useful in cottonseed processing at the Southern Regional Research Laboratory.)

- 19 GASTROCK, E. A., SPADARO, J. J., and GRACI, A. V., Jr.

PROGRESS ON THE APPLICATION OF FILTRATION-EXTRACTION TO THE PROCESSING OF SOYBEANS. Soybean Digest. 13(8): 16, 17. 1953.

Soybeans must be properly prepared for filtration extraction to get best results. These preparation methods were evaluated: Conditioning with moisture and heat, and rolling operations similar to those used in conventional soybean solvent-extraction plants; rolling and cooking operations similar to those used in hydraulic pressing of soybeans; and modified rolling and cooking operations comparable to those giving best results with cottonseed. Best results were obtained with the third method. Pilot-plant runs showed that filtration extraction of soybeans is practicable. (NRRL cooperated in the application of the process to soybeans.)

- 20 GRACI, A. V., Jr., REUTHER, C. G., Jr., EAVES, P. H. MOLAISSON, L. J., and SPADARO, J. J.

PILOT-PLANT APPLICATION OF FILTRATION-EXTRACTION TO RICE BRAN. Amer. Oil Chem. Soc. Jour. 30(4): 139-143. 1953.

The pilot-plant application to rice bran of filtration-extraction is described. The process consists of mildly cooking the rice bran, cooling to about 130°F., slurring the cooked bran with a miscella filtrate, filtering the slurry, and countercurrently washing the cake 3 times on a continuous, rotary, vacuum filter, followed by conventional recovery of oil and meal products. Cooking under the conditions described gives shorter filtration cycle time, better extractability, and virtually eliminates the fines problem. This development makes available a feasible continuous solvent-extraction process for rice bran.

- 21 HOLMES, R. L., MINOR, J. C., and MCKINNEY, R. S.
THE RATE OF DEVELOPMENT OF ACIDITY IN STORED TUNG SEEDS AND KERNELS.
Amer. Oil Chem. Soc. Jour. 30(4): 137-139. 1953.

The acid values of the oil in samples of whole tung seeds and whole and chopped kernels of high, medium, and low moisture contents after storage (sealed in tin cans) for different intervals in incubators maintained at 25°, 31°, and 38°C. were determined. Higher temperatures greatly increased the rate in chopped kernels, but had slight effect with oil of the whole seeds and whole kernels. The oils in whole seeds containing 7% and 12% moisture (stored for 4 weeks) and seeds containing 17% moisture (stored for 2 weeks) developed free fatty acids equivalent to acid values of 2.0 or less. Acid values of oils never exceeded 8.0 after storage for 13 weeks. Whole kernels developed even less free fatty acids than whole seeds, stored under similar conditions. Acid values in oil in chopped kernels of 5% and 7% moisture, after storage for 12 days was less than 8.0; but with a moisture of 12% acid value was more than this in less than a week.

- 22 KNOEFLER, N.B.,* EAVES, H. P., and VIX, H.L.E.
RESEARCH ON THE PREPARATION OF COTTONSEED MEATS FOR FILTRATION-EXTRACTION. Cotton Gin and Oil Mill Press 54(6): 98-100. 1953.

Cottonseed meals produced experimentally by different methods of processing are being used in various nutritional investigations. Conditions used in the rolling and cooking operations to prepare cottonseed meats for filtration-extraction have been studied in relation to the quality of the final meal and to the yield and quality of the oil. The preparation of cottonseed meats for filtration-extraction was compared with that for hydraulic pressing.

- 23 MCKINNEY, R. S., HOLMES, R. L., MINOR, J. C., and POTTER, G. F.
LOSS OF OIL IN HULLING TUNG FRUIT IN THE FIELD AND AT THE MILL. Amer. Oil Chem. Soc. Jour. 30(2): 83-85. 1953.

Methods for analyzing commercial tung hulls for oil have been developed. Samples of hulls from mill and field operations were collected and analyzed. Loss of oil when the fruit are hulled varied from 0.6% to 7.3%, with an average loss of 2.7% based on the total amount of oil in the fruit. Differences in loss between grove and mill hulling were not significant. With a loss of 2.7% of the oil in hulling, a recovery of 87.9% oil on the hulled nuts would be equivalent to a recovery of 85.5% oil on the whole fruit.

*Fellow, National Cottonseed Products Association

‡Bureau of Plant Industry, Soils, and Agricultural Engineering

- 24 PONS, W. A., Jr., MURRAY, M. D., LEBLANC, M.F.H., Jr., and CASTILLON, L.E.
GOSSYPOL MATERIAL BALANCE, DENATURATION OF PROTEIN, AND LOSS OF
THIAMINE IN COMMERCIAL PROCESSING OF COTTONSEED. Amer. Oil Chem. Soc.
Jour. 30(3): 128-132. 1953.

Cottonseed processed by five commercial mills was systematically examined with reference to free gossypol reduction, nitrogen solubility, thiamine reduction, material balances of total gossypol, and the distribution of gossypol in processing. One hydraulic mill reduced free gossypol in meal to a low level, about that obtained in screw pressing. For a given mill free gossypol contents of meals were fairly uniform. A relatively small amount of total gossypol was lost or destroyed during preparation of meals for either hydraulic- or screw-pressing; no significant loss could be attributed to pressing operations. Screw-pressed oils appear to contain several times as much gossypol as hydraulic-pressed oils, the amount depending on the extent of binding of gossypol in cooking and mechanical preparation of meals. The high temperatures developed in screw pressing contributed to a greater reduction in thiamine and nitrogen solubility than was observed for hydraulic pressing.

- 25 REUTHER, C. G., Jr., LE BLANC, M.F.H., Jr., BATSON, D. M., and KNOEPFLER, N. B.
A PRELIMINARY STUDY OF THE EFFECT OF MOISTURE CONTENT, ROLLING,
AND COOKING OF COTTONSEED MEALS ON THE CHEMICAL PROPERTIES OF
HYDRAULIC-PRESSED MEALS. Amer. Oil Chem. Soc. Jour. 30(1): 28-32.
1953.

Closely set 5-high rolls, corrugated rolls, and smooth rolls were used to accomplish gland breakage in cottonseed meals, and their effectiveness was compared. The degree of gland breakage was determined by an empirical method using hexane extraction. Severe (5-high rolls) conditions resulted in a large amount of gland breakage. A maximum gland breakage of 54% was generally obtained at moisture contents of 14% or above in the meals. Samples having a larger amount of gland breakage had a much lower content of free gossypol after cooking and pressing. Under the best conditions of rolling and cooking, in which the temperature of cooking did not exceed 225°F., a hydraulic-press meal was obtained with a free-gossypol content of .03% and nitrogen solubility of 40%.

Glyceride Oils and Fatty Acids

- 26 MACK, C. H., BICKFORD, W. G.
HYDROXYSTEARIC ACIDS. I. THE CATALYTIC HYDROGENATION OF THE 9, 10-
EPOXYSTEARATES. Jour. Organ. Chem. 18(6): 686-692. 1953.

The possibility of producing mono-hydroxy acids from domestic oil-bearing materials, as supplements or replacements for hydrogenated castor oil

fatty acids, has been investigated, since mono-epoxy compounds are readily available from oils of domestic origin. The cis- and trans-9, 10-epoxystearic acids and their methyl esters have been catalytically hydrogenated to their monohydroxy derivatives in glacial acetic acid using palladium-carbon catalyst. The position of the hydroxyl group was established by conversion to the corresponding keto acid. The hydrogenation is highly selective and leads to the formation of the 10-hydroxy compound to the exclusion of the 9-isomer. Approximately 5% of the hydroxyacetoxy compound forms as the result of a side reaction between the solvent and the epoxy compound. Observations of the reaction mechanism supported the concept that the hydrogenation of the epoxy compound proceeds through an oxonium-type ion intermediate.

27. MAGNE, F. C., DURR, E. L., SKAU

DENSITY-COMPOSITION-TEMPERATURE DATA FOR RICE BRAN OIL-COMMERCIAL
HEXANE MISCELLAS. Amer. Oil Chem. Soc. Jour. 30(1): 8-9. 1953.

Complete density-composition-temperature data have been obtained for binary systems of a refined rice bran oil with a commercial hexane and are tabulated. Specific gravities at 5% intervals of concentration and at 10 Fahrenheit-degree intervals of temperature are given and they can readily be converted to other density units. These data can be used to determine the specific gravity, if composition and temperature are known; or, conversely, to determine composition, if specific gravity and temperature are known. The data should be useful in commercial processing and control.

28. MORRIS, N. J., and FREEMAN, A. F.

DETERMINATION OF STABILITIES OF CRUDE PEANUT OILS BY ACCELERATED
AERATION METHODS. Food Technol. 7(6): 227-228. 1953.

Stabilities of crude peanut oils determined at 110°C. by Mehlenbacher's modification of the active oxygen method (A.O.M.) are compared with those determined by the active oxygen method at 97.8°C. The determination at 110°C. provides a suitable objective method for the determination of stability of crude peanut oils in 40% of the time required by use of the active oxygen method at 97.8°C.

29. O'CONNOR, R.T., HEINZELMAN, D. C., PACK, F. C., and PLANCK, R. W.

A METHOD FOR THE DETERMINATION OF LINOLEIC ACID AND CONJUGATED
DIENOIC ACIDS IN MATERIALS CONTAINING ELEOSTEARIC ACIDS. Amer. Oil
Chem. Soc. Jour. 30(5): 182-186. 1953.

A method based on modification of the equations of Method Cd 7-48 of the American Oil Chemists' Society (limited to "animal and vegetable fats containing only small amounts of preconjugged material,") is presented for determining linoleic acid in materials containing alpha-, beta- and mixtures of alpha-and beta-eleostearic acids, oleic acid, and saturated acids. It is limited to samples which do not contain nonconjugated trienoic acids (linolenic) acids. Several mixtures of cottonseed and dehydrated castor oil of known composition, to which varying amounts of alpha-and beta- and mixtures of alpha- and beta- eleostearic acids were

added were analyzed by the method. Comparison of these values with those calculated from the known composition of the mixtures showed that the proposed method gives reasonable results. The method has been applied to analyze foreign and domestic tung oils.

- 30 O'CONNOR, R. T., MACK, C. H., DU PRE', E. F., and BICKFORD, W. G.
HYDROXYSTEARIC ACIDS II. INFRARED SPECTRA AND X-RAY DIFFRACTION OF
10-AND 12-HYDROXYSTEARIC ACIDS AND METHYL ESTERS, AND OF 9, 10-
EPOXYSTEARIC ACIDS. Jour. Organ. Chem. 18(6): 693-701. 1953.

The infrared absorption spectra of 10- and 12-hydroxystearic acids, their methyl esters, and the 9, 10-epoxystearic acids from elaidic and oleic acids were determined. The most prominent bands in these spectra were correlated with molecular groupings most likely responsible for them. The hypothesis previously proposed to explain the formation of 10-hydroxystearic acid, rather than a mixture of the 9- and 10-isomers, upon hydrogenation of 9, 10-epoxystearic acid has been supported by infrared interpretations, and a possible explanation for the gelling tendency of 12-hydroxystearic acid as compared to the nongelling tendencies of 10-hydroxystearic acid and the methyl esters is given. The x-ray diffraction patterns for the two hydroxystearic acids and for their methyl esters were obtained, and the interplanar spacings measured from them are given along with their relative intensities.

- 31 STANSBURY, M. F., HOFFPAUIR, C. L., and HOPPER, T. H.
INFLUENCE OF VARIETY AND ENVIRONMENT ON THE IODINE VALUE OF COTTONSEED
OIL. Amer. Oil Chem. Soc. Jour. 30(3): 120-123. 1953.

Data are reported on the variation of the iodine value of oil from seed of 8 varieties of cotton grown at 13 locations during 3 years. Analysis of variance showed the influence of variety and of station-years to be highly significant statistically. Iodine value was negatively correlated with temperatures. Simple correlations for the relations between iodine value of the oils from seed of individual varieties and mean temperatures during 2 periods of boll and seed development were negative and highly significant. For the maturation period (35 days before boll opening) and the combined periods for squaring, fiber elongation, and maturation (73 days before boll opening) average reductions in iodine value per °F. increase in temperature were 0.760 and 1.172 units, respectively.

Meals and Proteins

- 32 JENSEN,*E. A., CONDON, M. Z., KARON, M. L., and ALTSCHUL, A. M.
RESEARCH ON COTTONSEED MEALS. Cotton Gin and Oil Mill Press. 54(5):
24-25, 28. 1953.

Data obtained by the fellow in research to develop a chemical measure of the nutritive value of cottonseed meal (part of a cooperative program of research on cottonseed processing to obtain oil of high quality with meal of improved nutritive value) are reported. Changes in chemical and physical properties of a cottonseed meal of known high nutritive value as the result of autoclaving are indicated. There is no change in the total or acid-soluble phosphorus or total nitrogen content; but free gossypol content and protein solubility in sodium chloride after autoclaving for

*Fellow, National Cottonseed Products Association, 1952.

15 minutes decrease sharply. Inorganic phosphorus gradually increases as time of autoclaving increases. Protein solubility in sodium hydroxide, total gossypol content, and soluble carbohydrate content decrease as time of autoclaving increases. Electrophoretic patterns indicate progressive degradation of protein as time of autoclaving increases. Correlation of these data with the nutritive value of the meals must await the completion of chick feeding experiments being done by cooperating organizations.

- 33 KARON, M. L., ADAMS, M. E., and ALTSCHUL, A. M.
COTTONSEED MEAL EXTRACTS. ELECTROPHORETIC PATTERNS OF BUFFER
EXTRACTS OF DIFFERENT NUTRITIVE VALUE. Jour. Agr. and Food Chem.
1(4): 314-318. 1953.

To determine the nature of changes taking place in cottonseed meal proteins as a result of differences in conditions of preparation, the electrophoretic patterns of cottonseed meal extracts were studied. (This is part of a research program on the improvement of the nutritional value of cottonseed meal and the laboratory determination of differences in nutritive value of the meal as a protein supplement.) As heat stress during processing increased, electrophoresis patterns of the soluble protein fraction of the meal changed. A new fast-moving component developed, and the original two major components became more difficult to resolve. These changes seem to correlate well with changes in nutritive value within a single series of related meals.

- 34 POMINSKI, J., and GORDON, W. O.
NOTE ON THE USE OF CALCIUM HYDROXIDE IN THE PREPARATION OF PEANUT
PROTEIN. Amer. Oil Chem. Soc. Jour. 30(2): 88, 89. 1953.

Laboratory peptizations showed that between pH of 7.2 and 9.5, nitrogen solubility obtained with calcium hydroxide solution was a constant and was practically equal to the value obtained with sodium hydroxide solution at pH 7.5. Pilot-plant yields of protein and settling rates of protein curds from calcium hydroxide-peptized solution with sulfur dioxide to lower the pH were equal to those obtained previously from sodium hydroxide-peptized solution. This information may be of interest in instances where use of lower-priced peptizing material is an advantage.

General (Oilseeds)

- 35 ANONYMOUS
RICE RESEARCH: SOUTHERN REGIONAL RESEARCH LABORATORY. Rice Annual:
(June) p. 10. 1953.

At this Laboratory information on predominant changes which take place in moist rice under different conditions of storage and on the effect of heat on properties of rough rice has been obtained. Predominant micro-organisms found on rice have been identified. Experimental results indicate that higher temperatures are necessary to bring about loss of viability as the moisture content of the rice is decreased, and that high temperature is not the factor responsible for low milling yield of rice.

36 FREEMAN, A. F.

BROAD ASPECTS OF RESEARCH ON UTILIZATION OF EDIBLE PEANUTS. Peanut Jour. and Nut World. 32(8): 15,39,40,41,42,43. 1953. Address before the annual meeting of the Peanut and Nut Salters' Assoc., April 18, Washington, D. C.

Informal conferences held at the Southern Regional Research Laboratory with representatives of the peanut industry and research workers of State and other Federal agencies are described. Representatives of the peanut butter industry recommended that priority be given to research to improve the quality of raw peanuts and to find uses for hulls and for peanuts which are undesirable for edible peanuts. Representatives of the nut-salting and confectionery industries recommended that priority be given to research to improve processes for blanching, deep-fat frying, and packaging of peanut products; and that research be conducted also to improve quality of raw peanuts.

SUGARCANE AND DERIVED PRODUCTS

Properties and Composition

37 BALCH, R. T.

FURTHER NOTES ON STARCH IN LOUISIANA CANES, JUICES, AND RAW SUGARS. Sugar Jour. 15(8): 11-15. 1953.

Forty-one pre-harvest samples of 1949 cane from 12 varieties, all contained starch, usually deposited in a restricted area of every sound node of the millable stalk. Twenty-six samples of commercially milled juice representing 9 varieties of 1951 cane all contained starch. Starch was found in all weekly samples of raw sugars from 7 factories collected through the 1951-52 season; the amount of starch decreased with the advance of the season, apparently reflecting the decrease in raw juice and resulting from freeze damage to the cane supply.

Processing

38 FORT, C. A., and SMITH, B. A.

REVERSE CYCLE DEMINERALIZATION OF SUGARCANE JUICES WITH ION-EXCHANGE RESINS. Sugar Jour. 15(9): 16, 18, 22-25. 1953.

Clarified sugarcane juices and synthetic model juices have been ion-exchanged by the reverse demineralization cycle, with negligible inversion of sucrose. When a strongly acidic cation-exchanger was substituted in this cycle it caused a 2.8% inversion of the sucrose present, while direct demineralization, using such a cation-exchanger as the first element in the cycle, gave a 4% inversion. Other points discussed include need for using dry solids and true sucrose for correct sugar and nonsugar balances; effect of removing reducing substances on the sugar balances; need for using batch operation of ion exchange to correctly determine the inversion of sucrose; effect of nonsugar composition on purity rise by ion exchange;

the presence of neutral organic nonsugars in juices which are of unknown composition.

- 39 GUILBEAU, W. F., and MARTIN, L. F.

A PILOT-PLANT FOR PROCESSING SMALL SAMPLES OF SUGAR CANE. The Sugar Jour. 16(1): 12, 14-15. 1953.

This small-scale pilot plant designed in consultation with the Department of Chemical Engineering of Louisiana State University and installed by BAIC at the Audubon Sugar Factory has given satisfactory results in processing research during the past 3 grinding seasons. The small-scale plant permits experiments on cane and juice of uniform composition--at an average rate of only 50 gallons per hour, but continuously and simulating conditions in large-scale manufacture. An experiment can be completed in a day, using a 2-or 3- ton sample. Described are the equipment and operations for juice extraction and storage, liming and heating, and evaporation, and requirements for installation and application. (Available from the Southern Laboratory to persons contemplating installation is a description of the equipment, with 7 drawings giving dimensions and capacities of units.)

Confectionery

- 40 ANONYMOUS

ANTIOXIDANTS. AIC-347. 6 pages. Processed. January 1953.

A conclusion reached in studies of the value of antioxidants in stabilizing certain types of candy is that the right antioxidant, used properly, will prolong shelf-life. Explained are: when to use and when not to use antioxidants; which antioxidants to use; and how to prepare and add the antioxidant to the candy batch. Suppliers of the effective antioxidants are listed. The stable shelf life found in experiments with 7 commercial antioxidants added to cream fondant with 5% butter is illustrated by a bar graph. (This is research supported jointly by BAIC and the National Confectioners' Association.)

- 41 MARTIN, L. F., ROBINSON, H. M., and FAHS, F. J.

PROGRESS IN CANDY RESEARCH. Report No. 27. Period Covered: Nov. 1, 1952 - June 1, 1953. Report on Utilization of Agricultural Products in Confectionery in Cooperation with the National Confectioners' Association. Processed by Nat'l. Confectioners' Assoc. 28 pages. 1953.

Starch jellies containing emulsifiers will retain their improved tenderness almost indefinitely. They are superior when made with polyoxyethylene-stearates. Further tests in cooperation with the Brewers' Yeast Council confirmed the antioxidant effect of yeast added to fudge, butter mints, and butter creams. Effects of adding glycerol and propylene glycol, together with sorbitol, to prevent loss of moisture and development of free fatty acids in fudge during storage were studied. At the request of the Quartermaster, butter creams were made for evaluation as components of a

4-piece, multiflavored butter cream bar. Pectin jellies containing 75 parts of honey to 25 parts of sugar were satisfactory. Formulas have been modified to produce jellies of either cut or cast types, and one honey producer is contemplating the marketing of such jellies, to be made by a candy-manufacturing firm. Almonds have been coated with zein for comparison with uncoated controls stored over water in desiccators.

FRUITS AND VEGETABLES

Citrus Fruits

- 42 BISSETT, O. W., VELDHUIS, M. K., and RUSHING, N.B.
EFFECT OF HEAT TREATMENT TEMPERATURE ON THE STORAGE LIFE OF
VALENCIA ORANGE CONCENTRATES. Food Technol. 7(6): 258, 259 and
260. 1953.

Orange juices of several concentrations were heat-treated at a series of temperatures and then examined for bacteriological and pectinesterase activities. Complete heat stabilization of the cloud in single-strength juice, 2-fold, and 4-fold concentrates was attained at 190° and 200°, while 160° was sufficient for 6-fold concentrates. Products processed at 160°F. or above were not subject to can swelling during storage at either 35° or 80°. Viable organisms decreased rapidly with increasing treatment temperature up to 150°, while at higher temperatures decreases in count were not so great for each increase in treatment temperature. Pectinesterase activity was sharply reduced by treatment temperatures of 120° to 150°; was not appreciably changed between 150° and 180°, and then was reduced to very low activity by treatments of 190° and 200°.

- 43 HUFFMAN, W.A.H., LIME, B.J., and SCOTT, W.C.
STABILIZATION OF GRAPEFRUIT CONCENTRATE - A PROGRESS REPORT.
Seventh Ann. Rio Grande Valley Hort. Inst. Proc. Page 106. 1953.
Also published in Assoc. South. Agri. Workers Proc. Page 142. 1953.

Methods of preparing a concentrate from Texas-grown grapefruit which will remain stable for 6 to 12 months when stored at 40°F. or above are being studied. Preliminary findings indicate that proper pasteurization procedures may make possible the preparation of a 4-fold concentrate which will remain stable for at least 6 months at 50°F. or below. Small amounts of terpeneless grapefruit oil enhanced the flavor and aroma of concentrates without adversely affecting flavor quality after storage. Addition of chemical preservatives resulted in a juice having poor flavor. The most satisfactory stabilization (as to flavor, cloud, enzyme inactivation, and general quality characteristics) was attained by adding 0.57% lactose plus .06% citric acid, flash-pasteurizing at 194°F., concentrating under high vacuum and low temperature to 59° Brix, repasteurizing at 167°-176°F., and filling under superheated steam.

- 44 HUFFMAN, W. A. H., LIME, B. J., and SCOTT, W. C.
PROCESSED JUICES FROM TEXAS RED AND PINK GRAPEFRUIT - A PROGRESS
REPORT. Seventh Ann. Rio Grande Valley Hort. Inst. Proc.
pages 102-105. 1953.

Preliminary results are encouraging for the preparation of canned single-strength pink grapefruit juice and pink frozen concentrates using the naturally occurring ingredients of the fresh fruit. It is practical to blend juice from white grapefruit with centrifuged juice from red or pink varieties, but this method does not capitalize on the natural pigmentation of colored citrus.

- 45 HUSKINS, C. W., and SWIFT, L. J
CHANGES IN THE LIPID FRACTION OF VALENCIA ORANGE JUICE DURING
PASTEURIZATION. Food Res. 18(3): 305-307. 1953.

The purpose is to compare analytical data on the composition of the lipids from fresh orange juice and from the same juice almost immediately after pasteurization. The comparative analysis of the lipid from fresh and pasteurized orange juices shows little change in composition. A slight loss of unsaponifiable matter was noted. It appears unlikely that changes in flavor and lipid composition, due to pasteurization, are closely related.

- 46 PATRICK, R.
COLIFORM BACTERIA FROM ORANGE CONCENTRATE AND DAMAGED ORANGES.
Food Technol. 7(4): 157-159. 1953.

Evidence is presented to show that of 217 coliform cultures obtained from orange concentrate and damaged oranges and grouped in accordance with their IMVIC test reactions, 64% were Escherichia coli types, 19% were Aerobacter aerogenes types, and 17% were intermediate types. Of the E. coli types 41% gave IMVIC patterns considered of sanitary significance.

Vegetables

- 47 HUFFMAN, W. A. H., LIME, B. J., and SCOTT, W. C.
CHANGES IN PROCESSING METHODS TO AVOID DARKENING IN CANNED TEXAS
VALLEY BEETS. Seventh Ann. Rio Grande Valley Hort. Inst. Proc.
pages 143-147. 1953.

Laboratory studies, together with observations of the general processing conditions found in several canning plants, indicates the need for changes in processing procedures and equipment to avoid darkening in canned beets. It appears that darkening can be reduced and probably held within acceptable limits by use of adequate steam exhaust. Quality of canned beets could also be improved by replacing iron equipment with stainless steel or other suitable material, and by more expeditious handling during processing.

48 MCFARLANE, V. H.

SWEETPOTATO RESEARCH. Activities Report; Research and Development Associates, Food and Container Institute. 5(1): 24-25. 1953.

Processes developed to produce a high-quality sweetpotato starch and by-product pulp feed were applied in two factories in Mississippi and Florida. But these factories suspended operations because costs of growing the crop were too high to make production of the starch profitable so the Bureau reduced and then terminated its research on the industrial uses; later reactivated research along different lines. Limited studies were started to determine changes in the properties of sweetpotatoes that affect their quality and suitability for processing into acceptable food products. First were studied the biological activity and the enzyme systems in the sweetpotato; next, characteristics of the raw material during storage and processing and characteristics of dehydrated product. These studies were sponsored by the Quartermaster Food and Container Institute and were conducted in cooperation also with Louisiana State University, Baton Rouge. Laboratory equipment which will dehydrate up to 100 pounds of material per run will be used to prepare products for taste tests and chemical analyses before and after storage. In projects proposed for 1953 will be investigated sugar components in starch, sugar transformations in sweetpotatoes during storage and processing and their relation to quality and/or deteriorative effects; determination of changes in composition of sweetpotatoes resulting from processing operations; raw material handling procedures, facilities, and processes in canning plants, and their relation to the preparation and quality improvement of dehydrated sweetpotatoes and other processed products.

PINE GUM AND DERIVED PRODUCTS

49 LAWRENCE, R. V., and ECKHARDT, O.S.

ADDITION COMPOUNDS OF ROSIN AND MALEIC ANHYDRIDE AND THEIR PRODUCTION
U. S. Patent No. 2,628,226: February 10, 1953.

Thermally decomposable crystalline addition products of carbon tetrachloride and maleopimaric acid are produced by contacting the mixture formed by fusing maleic anhydride and rosin with carbon tetrachloride. The other components of the mixture are soluble in carbon tetrachloride, and the production, isolation, and decomposition of the addition products provide a method of isolating pure maleopimaric acid.

MISCELLANEOUS

50 GORDON, W. O., and VELDHUIS, M. K.

CONTROLLING FOAM IN SUBMERGED AND AERATED PROPAGATION OF MICROORGANISMS.
U. S. Patent No. 2,635,070: April 14, 1953.

Described is a continuous process of propagating microorganisms, in which a liquid nutrient is aerated in tanks from which air and foam are discharged from a large-diameter pipe near the top and nutrient is discharged

separately from a smaller pipe near the bottom. Foam-forming nutrients can be used without anti-foaming agents.

51 HOFFPAUIR, C. L.

REPORT ON STARCH IN PLANTS. MODIFICATION OF THE ANTHRONE PROCEDURE.
Assoc. Off. Agr. Chem. Jour. 36(2): 400-401. 1953.

When the anthrone procedure was modified by the use of 4.8 N perchloric acid for dispersing the purified starch, results obtained by three analysts on samples of alfalfa, buckwheat leaves, and peanut meal showed satisfactory reproducibility. Previously reported erratic results appeared to be due to incomplete dispersion of the purified starch before color development.

52 MAGNE, F. C., and MOD, R. R.

PLASTICIZERS FROM ACONITIC AND TRICARBALLYLIC ACIDS. Indus. and Engin. Chem. 45(7): 1546-1547. 1953.

Rapid expansion in the field of vinyl resin plasticizers has increased the demand for efficient plasticizing materials. Since aconitic and tricarballic acids have three esterifiable groups, their esters are potential plasticizers for many resins. In screening tests most of the esters equalled and some excelled dioctyl phthalate in the various plasticizing properties (tensile strength, modulus at 100% elongation, and brittle temperature), and in vapor pressure, density, and viscosity. The results suggest that most of these esters may be substituted for dioctyl phthalate in plasticizing vinyl resin.

53 MASON, A. C. F.

AIDS FOR THE ANALYST...MODIFIED VIGREUX COLUMN. Analyt. Chem. 25(3): 533. 1953.

A modified vigreux column with a nonflooding feature has been found useful in the distillation of high boiling liquids such as methyl ricinoleate or the triesters of aconitic acid.

54 PONS, W. A., Jr., STANSBURY, M. F., and HOFFPAUIR, C. L.

AN ANALYTICAL SYSTEM FOR DETERMINING PHOSPHORUS COMPOUNDS IN PLANT MATERIALS. Assoc. Off. Agr. Chem. Jour. 36(2): 492-504. 1953.

Analytical procedures for the determination of total, inorganic, acid-soluble, phosphatide, and phytin phosphorus are described. Two colorimetric phosphorus methods used in the final evaluation of these different types of phosphorus compounds are given in some detail. Phosphorus present as nucleic acids or nucleotides and as carbohydrate esters may be calculated from the analytical data for the other types of phosphorus. Experimental evidence substantiates the choice of these phosphorus methods and their validity when applied to cottonseed, and the procedures should be equally suitable for the analysis of other oilseeds and plant materials.

RESEARCH ACHIEVEMENT SHEETS

Better Gum Turpentine. Res. Achvt. Sheet 157 (C). (Processed.)
March 1953.

Frozen Purees from Citrus Fruits. Res. Achvt. Sheet 158(C).
(Processed.) March 1953.

U.S.D.A. NEWS RELEASES

USDA Research Develops New Process to Flameproof Cotton
Fabrics. March 9, 1953. USDA 558-53.

REPUBLICATIONS

ETCHELLS, J.L., OHMER*, H. B., and JONES*, I. D.

PASTEURIZED PICKLES. Res. and Farming. N. C. Agr. Expt. Sta.

Prog. Rep. Autumn 1951. Issued March 1953. [Previous publication:

Pasteurization Aids Pickle Industry. Res. Achvt. Sheet 138(C).

(Processed.) June 1951.]

*Department of Horticulture, North Carolina State College, Raleigh,
North Carolina.

CONTRACT RESEARCH PUBLICATIONS*

(Reports of work done under cooperative agreement with the Department of Agriculture and authorized by the Research and Marketing Act of 1946. Work covered by these publications was supervised by the Southern Regional Research Laboratory.)

No.

COTTON

Fiber and Fundamental Investigations

- 1 FORZIATI, F. H., BROWNELL, R. M., and HUNT, C. M.
SURFACE AREAS OF COTTONS AND MODIFIED COTTONS BEFORE AND AFTER SWELLING AS DETERMINED BY NITROGEN SORPTION. Research Paper 2401. Jour. Nat'l Bur. Standards 50(3): 139-145. 1953. (Contractor: National Bureau of Standards)

Surface areas of cottons differing in variety and maturity and of cottons that had been subjected to various physical and chemical treatments were measured before and after swelling. The specific surfaces of unswollen fibers were less than 1 square meter per gram; those of the swollen fibers ranged from 4 to 148 square meters per gram. Purification and mercerization increased surface available after swelling; methylenation decreased it; ethylamine treatment had no effect. In the early stages of methanolysis, the surface available after swelling decreased; later, increased. The procedure used is believed to be useful in evaluating the effects of various treatments on cottons and other cellulosic fibers.

Chemical Processing

- 2 COMPTON, J., and HART, W. J.
SOILING AND SOIL RETENTION IN TEXTILE FIBERS: SUSPENDING POWER OF SURFACTANTS. Indus. and Engin. Chem. 45(3): 597-602. 1953.
(Contractor: Institute of Textile Technology)

Soil is redeposited during laundering through distribution of suspended soil particles between the liquor penetrating the fabric and the remainder of the bath; and through attachment of soil particles to the fiber surfaces. In previous work a chopped fiber technique was developed which permits soil redeposition studies for the first time without the complicating factor of fabric construction. The mechanism of soil redeposition

*See page 25 for a list of contract research publications reporting work supervised by the SRRL from 1946-1952.

deposition on fabrics was analyzed and was correlated with the suspending power of surface active substances (surfactants). A rapid quantitative method for the determination of suspending power was given and the behavior of a wide range of surfactant-soil-fiber systems was studied. Results and techniques should be of interest to the textile and detergent industries.

- 3 COMPTON, J., and HART, W. J.
A STUDY OF SOILING AND SOIL RETENTION IN TEXTILE FIBERS. GREASE-CARBON BLACK SOIL-COTTON FIBER SYSTEMS. Textile Res. Jour. 23(3): 158-163. 1953. (Contractor: Institute of Textile Technology)

The general system grease-carbon black soils-cotton fiber has been studied. Sorptive binding of soil to fiber occurs in such systems by a grease layer which binds the soil particles to the fiber surface. Evidence of this is the effect of detergents and solvents on the grease-soil-fiber bond in reducing the tenacity with which soil is held. Soil particles may be attached to the fiber surface by sorption, microocclusion, or both. Sorptive bonding of soil particles on a greasy fiber surface does not appear to occur during the primary stage of soil deposition, but only as water is removed from the system. Crevice area distribution and soiling rate curves indicate that the addition of oils and greases up to 5% of the weight of the fiber does not markedly alter the surface contour of the fiber in the submicroscopic range of 25 to 110 μ .

- 4 FOURT, L., and STREICHER, P.
IMPROVEMENT OF LUSTER OF COTTON. PART II: DECRYSTALLIZING AND MERCERIZING -- INFLUENCE ON LUSTER. Textile Res. Jour. 23(1): 23-28. 1953.

Anhydrous ethylamine and solutions of sodium hydroxide both affect the luster of cotton yarns in the same direction as well as having similar effects on properties which indicate decrease of crystallinity, or increase of accessibility of the cellulose. However, the extent of the effect is less for ethylamine, under the conditions examined, with this exception: when the yarn is held at nearly constant length by wrapping on plates, with minimum possibility of mechanical action, the ethylamine treatment has more effect on moisture sorption, though less on luster, than the relatively low degree of mercerization obtained on plates. Tension or control of length is required to produce luster. Luster is increased more by mercerizing after than before the ethylamine treatment. The stretching of the yarn, made possible by swelling, and improved fiber roundness are more important for high luster than degree of change of crystallinity of cellulose.

- 5 HART, W. J., and COMPTON, J.
PRIMARY DEPOSITION OF GREASE-FREE CARBON BLACK SOIL ON VARIOUS TYPES OF TEXTILE FIBERS. Textile Res. Jour. 23(3): 164-169. 1953.

For cotton, silk, wool, linen, rayon, nylon, and Fortisan, soil-fiber complexes with grease-free carbon blacks have been studied. Varying

widely for the different fibers are the percent distribution of total surface occupied by crevices of varying diameter; the rate of primary deposition of soil; and the suspending power of different surfactants for a given soil. Synergism of surfactants appears to be a property characteristic of the entire soil-fiber-surfactant system, rather than one inherent in a given additive or surfactant combination. Each of the soil-fiber complexes studied appears to be micro-occlusive, and shows a zero temperature coefficient of stability. The application of a small quantity of energy to the systems, in the form of mechanical agitation, resulted in a relatively large decrease in soil retention by the fiber, whereas the introduction of a large quantity of energy as thermal energy had little or no effect.

- 6 HART, W. J., and COMPTON, J.
A STUDY OF SOILING AND SOIL RETENTION IN TEXTILE FIBERS. VI. THE EFFECT OF YARN AND FABRIC STRUCTURE IN SOIL RETENTION. Textile Res. Jour. 23(6): 418-423. 1953.

Necessary conditions for the application of the Kubelka-Munk equation to fabric-soil systems for the determination of soil content from reflectance measurements have been given. Uniformity of particle distribution in the fabric, random orientation of the soil particles, and known or constant specific absorbancy of the soil. The phenomenon of macro-occlusion, or interfiber and interyarn entrapment of soil particles in fabric structures, has been studied for several types of fibers and fabrics and found to be a major factor in soil retention. It is suggested that soil particle macro-occlusion in soiled fabric structures is largely responsible for difficulty in removing soil during laundering and in obtaining consistent, precise detergency data.

OILSEEDS AND OTHER OIL-BEARING MATERIALS

Properties and Reactions

- 7 SHIRLEY, D. A., ZIETZ, J. R., Jr., and REEDY, W. H.
ALKYLATION WITH LONG-CHAIN p-TOLUENESULFONATES. IV. ALKYLATION OF ALCOHOLS AND AMINES WITH n-OCTADECYL p-TOLUENESULFONATE. Jour. Organic Chem. 18(4): 378-381. 1953. (Contractor: Tulane University)

Alkylation of a series of alcohols by n-octadecyl p-toluenesulfonate allows formation of the corresponding n-octadecyl ethers in yields ranging from 30 to 80%. Alkylation of a series of aliphatic and aromatic primary amines gives mixtures of N-n-octadecyl and N,N-di-n-octadecyl derivatives in total yields ranging in general from 30 to 70%. (These studies were part of a general study of alkylation reactions of long-chain p-toluenesulfonate esters. Previous work has been done on alkylation of phenols, thiophenols, and mercaptans.)

Processing and Storage

8 AUTREY, H. A.

EFFECT OF VARIABLES UPON MILLING YIELDS. The Rice Journal (Rice Annual): 25-26. 1953 (Contractor: University of Arkansas)

The University of Arkansas, conducting experiments during the crop years 1949, 1950, and 1951, using a complete mill of conventional design, constructed on a pilot-plant scale, found close correlations between yield of head rice and percent bran removal (for Zenith and Rexark varieties). Approximately 20 percent of the breakage occurs at the same time that 75 percent of the total amount of bran is removed during milling. The removal of the remaining bran is accompanied by 80 percent of the breakage. The steaming of brown rice before milling results in only small gains in average yield of head rice. The addition of abrasives to brown rice before milling does not increase the yield materially; however, there is a slight increase in yield from rice in which the bran is held tightly to the kernel. Abrasives increase huller capacity by 20 to 30 percent. Use of steam and abrasives together increases huller capacity by as much as 40 percent. The effect of mill-room temperature upon yield of head rice appeared to be minor, except where the temperature of the rice differed considerably from room temperature. Relative humidity has a significant effect on the efficiency of the milling process with Zenith, Bluebonnet, and Rexark varieties; optimum humidity was 70 percent to 80 percent.

9 CARTER, CLYDE L.

AN INVESTIGATION OF SOME FACTORS AFFECTING THE EFFICIENCY OF HYDRAULIC PRESSING OF COTTONSEED. Engin. Expt. Sta. University of Tennessee. Bull. No. 18. June 1953.

This report describes, in part, an investigation carried out between 1949 and 1952, setting forth conclusions, recommendations for further work, and recommended pressroom operating methods for hydraulic press mills. A thorough and systematic study was made of pressroom variables, using bench-scale laboratory equipment, and the validity of the results was tested by performing a limited number of experiments in an operating mill. The primary objective was to determine the effect of pressing variables (total pressure applied, rate of application of pressure, pressing time, pressing temperature, and moisture content and hull content and type or variety of seed) on the amount of oil removed from the cooked meats. A secondary objective was to determine the effect of these variables on the quality of the oil and meal.

SUGARCANE PRODUCTS

- 10 KOWKABANY, G. N., BINKLEY,* W. W., and WOLFROM,* M. L.
AMINO ACIDS IN CANE JUICE AND CANE FINAL MOLASSES. Agr. and Food
Chem. 1(1): 84-87. 1953.

Cane blackstrap molasses contains as much as 50 to 60% simple sugars. Recovery of these sugars in sucrose production is not economical because of the presence of substances formed from reaction of the sugars with amino acids of sugar cane juice. Chromatographic procedures were applied to this juice and its corresponding molasses to identify the responsible amino acids. Two-dimensional, ascending paper chromatography indicates the probable presence of asparagine, aspartic acid, glutamine, glutamic acid, glycine, alanine, valine, leucine (or isoleucine), serine, tyrosine, and γ -aminobutyric acid in Florida cane juice and (except serine, tyrosine, and glutamine) in its corresponding final molasses.

*Ohio State University

CONTRACT MANUSCRIPTS 1946 - 1952 *

No.

COTTON

Fiber and Fundamental Investigations

- 1 Cotton powder for infrared transmission measurements. F. H. Forziati, W. K. Stone, J. W. Rowen, and W. D. Appel. Natl. Bur. Standards, Jour. Res. 45(2): 109-113. 1950.
- 2 Effect of changes in crystalline structure on the infrared absorption spectrum of cellulose. F. H. Forziati, and J. W. Rowen. Natl. Bur. Standards, Jour. Res. 46(1): 38-42. 1951.
- 3 Spectrophotometric determination of carboxyl in cellulose. F. H. Forziati, J. W. Rowen, and E. K. Plyler. Natl. Bur. Standards. Jour. Res. 46(4): 288-291. 1951.

Mechanical Processing

- 4 Templates facilitate counting of neps. J. F. Bogdan. Textile World 99(6): 142. 1949.
- 5 Nomograph gives nep count per unit weight. J. F. Bogdan. Textile World 99(10): 128-129. 1949.
- 6 Card Flat Settings indicated by dial gauges. J. F. Bogdan. Textile World 99(10): 172. 1949.
- 7 Developments in nep control. H. L. Loveless. Textile Forum, N. C. State College 6(3): 11, 12, 30. 1949.
- 8 Miniature slasher developed at North Carolina State. W. E. Shinn, and C. B. Sink. Textile World 99(8): 122-123, 210, 212. 1949.
- 9 A review of literature on neps. J. F. Bogdan. Textile Indus. 114(1): 98-103, 105, 107. 1950.
- 10 What happens to cotton in multiple drawing? H. L. Loveless. Textile World 100(8): 110, 111. 1950.
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